

RESEARCH ARTICLE

Drug Information Education in Doctor of Pharmacy Programs

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Objective. To characterize pharmacy program standards and trends in drug information education.

Methods. A questionnaire containing 34 questions addressing general demographic characteristics, organization, and content of drug information education was distributed to 86 colleges and schools of pharmacy in the United States using a Web-based survey system.

Results. Sixty colleges responded (73% response rate). All colleges offered a campus-based 6-year first-professional degree PharmD program. Didactic drug information was a required course in over 70% of these schools. Only 51 of the 60 colleges offered an advanced pharmacy practice experience (APPE) in drug information, and 62% of these did so only on an elective basis.

Conclusion. Although almost all of the PharmD programs in the US include a required course in drug information, the majority do not have a required APPE in this important area.

Keywords: drug information, course, curriculum, pharmacy education, experiential training, advanced pharmacy practice experience

INTRODUCTION

Advances in health care have created an increasing demand for pharmacists to play a key role as drug information providers to health care professionals and the public.¹ The profession's support for pharmaceutical care requires pharmacists to become the primary source of drug knowledge.² Pharmacists' interventions directly impact patient care, decrease the likelihood of medication errors, and improve medication compliance.³⁻⁵ A recent Cochrane Database review examining the expanding role of pharmacists on patient outcomes, health care utilization, and cost indicates that pharmacist intervention can improve patient behavior and adherence and improve physician prescribing.⁶ The process of selecting the most suitable drugs for individual patients by physicians and other prescribers is becoming increasingly complex with the growing number and complexity of medications. For the past 6 years, more than 65 drugs and biologicals were approved by the US Food and Drug Administra-

tion (FDA) on a yearly basis, with an increasing trend anticipated in the future.⁷

Effective drug information and evaluation skills are a vital part of routine pharmacy practice. In preparation for practice and lifelong learning, it is critical that all pharmacy students receive adequate training in drug information and drug literature evaluation as a fundamental core upon which to build their clinical skills. Practicing pharmacists today are faced with the challenge of keeping up with an increasing number of new drugs and an increasing number of biomedical journals and articles available on MEDLINE.⁸ Furthermore, prescribing decisions and research can be unduly influenced by the pharmaceutical industry.⁹⁻¹² Pharmacists have a function that is unique to their profession as providers of drug information. As pharmacists have become increasingly involved in influencing prescribing, it is important that they provide unbiased evidence-based drug information to prescribers. To provide accurate in-depth drug information requires the development of drug information skills through both didactic and experiential training programs.¹³

The majority of schools and colleges of pharmacy within the United States offer a 6-year first-professional PharmD degree program. The purpose of this descriptive study is to summarize data on the current status of drug

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information education and curricula content offered in all first-professional degree doctor of pharmacy programs in the United States.

METHODS

This study was developed to compare general demographic characteristics and the organization and content of drug information didactic and experiential curricula in first-professional degree doctor of pharmacy programs within the United States.

To characterize the demographic description of survey respondents, the following data were collected: the title and position of the survey participants; the type of pharmacy programs offered at their institution; the number of years their entry-level PharmD program had been offered; and the current and projected class sizes of entry-level PharmD programs.

The consensus guidelines developed by Troutman,¹⁴ which addressed didactic and experiential subject matters to be included as part of an ideal drug information curriculum for a PharmD program, were used to assess the content of drug information courses evaluated in this study. The survey questions were developed to characterize drug information course contents and to determine whether both didactic and experiential components were offered as required or elective courses. General subject matter considered important in the didactic component were approaches to handling drug information requests in a systematic manner; drug literature evaluation; adverse event management; drug policy management; drug approval process; keeping current with the literature; ethical legal issues; quality assurance in drug information; and history and philosophy of drug information services. Respondents were then asked to rank the relative importance of these subject areas as part of an ideal drug information didactic component.

Experiential activities evaluated in this study included the following: retrieval of drug information from appropriate resources; demonstration of drug literature evaluation and communication skills through verbal and written activities; application of drug literature evaluation skills; and participation in drug information quality assurance activities. Respondents were asked about the different drug information practice experiences available to students and the location of their primary teaching site. In addition, survey questions were designed to look at the organization of the drug information course within the professional program and to determine the qualifications of the instructors and preceptors of drug information. If a program did not offer or require a drug information didactic or practice experience, respondents were asked to identify how a student's drug information skills were

evaluated and to state the reasons for not including this component in their curriculum. The University of Connecticut Institutional Review Board approved the study for exempt review.

The proposed survey instrument was peer-reviewed by a selected panel of 4 drug information experts from US pharmacy schools. Modifications to the questionnaire were made based on the comments and suggestions of these peer reviewers. The final Web-based survey consisted of 34 questions. Questionnaires were sent to all 86 US colleges and schools of pharmacy listed on the web site of the American Association of Colleges of Pharmacy.¹⁵ Survey participants were drug information course coordinators, drug information educators, or pharmacy practice department chairs. Individual participants were identified via their respective school web sites or by personal phone calls made to the chair or other representative of pharmacy practice departments. The Web-based survey instrument was accompanied by a cover letter requesting participation and was distributed electronically to all participants in October 2003. This survey instrument was made available online to all study participants for a 2-week period. A follow-up electronic letter and an extension of the online survey by 1 week were sent to participants who had not responded during the first 2-week response period. Electronic surveys returned undeliverable for 2 consecutive periods were excluded ($n = 2$). The survey results were tracked and managed by Web-based Survey Tracker 4.0 (*Survey Tracker* for Windows, Training Technologies Inc, Cincinnati, Ohio, 2003).

RESULTS

The overall response rate was 73% (60 of the 84 schools surveyed returned the questionnaire).

Demographic Characteristics

The majority of respondents were drug information course coordinators affiliated with academic institutions (44%). Further generalizations about the survey respondents were not possible because most had selected more than one title describing their position. All the responding institutions offered a campus-based 6-year first-professional PharmD program. Furthermore, 47% of these schools also offered a nontraditional PharmD program, 15% offered a first-professional PharmD distance education program; and 10% continued to offer a post-baccalaureate PharmD program.

Seventy-five percent of schools ($n = 45$) reported that their first-professional PharmD programs had existed for more than 5 years. Graduating class sizes for these programs in 2002-2003 ranged from 50 to 200 students, with

13 colleges (21%) graduating more than 100 students. Approximately 40% (24) of respondents also projected a maximum graduating class size of more than 100 students for their first-professional PharmD degree programs (range 120-240).

Didactic Drug Information

All schools offered didactic drug information education in their first-professional PharmD programs. In approximately 70% (43) of pharmacy schools, the didactic component of drug information was offered as a required and standalone course. The remainder of schools reported that drug information was either integrated within another course or throughout the professional program (flowchart shown in Figure 1). Sixty-five percent (39) of schools devoted between 2 and 3 classroom hours per week to teaching didactic drug information concepts.

Sixty-three percent (38/60) of respondents indicated that the drug information didactic course work was team-taught and 90% indicated that the primary instructor of the course was a full-time faculty member. Seventy-five percent (42/56) of the primary instructors had some level of postgraduate training in residencies or fellowships, and 54% (22/41) of these completed postgraduate residency or fellowship training specializing in drug information.

Thirty-five percent (19) of colleges of pharmacy placed drug information in the second-professional year of the curriculum; and 19% (10) placed it in the third-professional year. Multiple schools (11) offered drug information didactic course work integrated into 2 professional years.

Fifty percent (20/38) of respondents indicated that their drug information didactic course had a laboratory

or recitation component incorporated. Unfortunately, because of inconsistent reporting of data, no generalizations could be made regarding the number of laboratory hours per week, location of the laboratory, average number of students, or number of facilitators per session. The activities typically covered in these laboratory or recitation sessions are shown in Table 1. Fifty-eight percent (22/38) of respondents also reported that 2 or more of these activities were covered.

Integrated Drug Information Didactic Courses

Overall, 30% (17) of the programs surveyed offered an integrated drug information curriculum. Fifteen percent (9) of the colleges integrated drug information instruction within another course (more frequently with a drug literature evaluation course), and 13% (8) integrated drug information throughout the entire professional curriculum (Figure 1).

Seven of the 9 colleges that integrated drug information instruction within another course indicated they offered a 1- to 2-hour laboratory or recitation component per week either in a classroom setting, laboratory, or drug information center. The average number of students ranged from 1 to 40 per session, generally with one facilitator. Eight colleges offered an integrated model for teaching drug information across the entire professional curriculum. Almost all of these colleges included a laboratory or recitation component in their curricula. The top 3 activities covered in these integrated laboratory or recitation sessions included advanced literature evaluation, advanced literature searching, and answering drug information questions (Table 1).

Fifty-seven percent of respondents indicated their college used a required textbook or manual for the drug information course, and most of them (79%) used *Drug Information: a Guide for Pharmacists* by Malone.¹⁶ All required or recommended textbooks are shown in Table 2.

One section of the survey instrument required respondents to indicate the relative importance of suggested didactic subject matter to be included as part of an ideal drug information curriculum.¹⁰ The respondents indicated whether the subject areas were covered in their college's course and the relative importance of the subject matter in a drug information didactic component on a scale of 1 = very important to 5 = not important. The results are presented in Table 3.

Experiential Education in Drug Information

Among schools that offered an advanced pharmacy practice experience (APPE) in drug information, 23% (14/60) indicated it was required and 62% (37/60) indicated it was an elective. Nine respondents (15%) did not

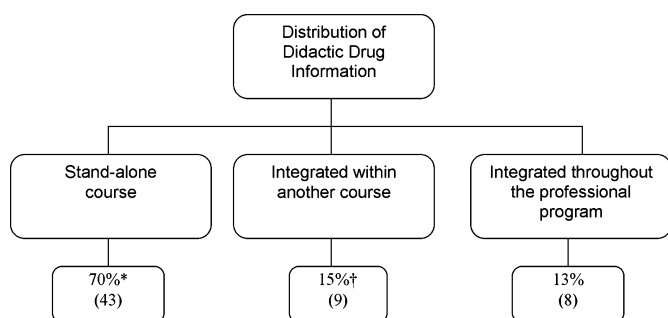


Figure 1. Flow chart showing distribution of didactic drug information course. *Only one semester of drug information was offered by 71% (29/41) of respondents who offered a standalone didactic drug information course. †In this type of integrated course, 31%-50% of the course work was devoted to drug information concepts and more than half (5/9) indicated that the course was available for only 1 semester. This course was usually offered between the P1 and P3 years of the curriculum.

Table 1. Distribution of Activities Covered in Didactic Laboratory or Recitation Classes

Activity Covered	Standalone Course, n = 38	Integrated Within Another Course, n = 7	Integrated Throughout Professional Curriculum, n = 6
Advanced literature evaluation	14	7	4
Advanced literature searching	19	6	4
Managing adverse drug reactions	5	4	0
Answering drug information questions	17	7	3
Journal club	12	3	5
Medication use evaluation	5	3	0
Monograph preparation	6	2	1
Research project	2	1	1

offer an APPE in drug information either because drug information was assumed to be covered in other APPEs or in laboratory or recitation experiences (4 of these schools mentioned use of a drug information portfolio or formal drug information consults in their APPE). Other reasons for not offering an APPE in drug information were a lack of adequate training sites offering drug information and a lack of faculty resources.

Of the 14 respondents with a required APPE in drug information, half of them offered a 4-week APPE (range 3-6 weeks), and of the 37 respondents with an elective APPE in drug information, 60% (22) offered a 4-week APPE (range 4-6 weeks). The frequency and scope of activities covered in the drug information APPEs are shown in Figure 2. The most common activities covered (94%) were answering questions, advanced literature evaluation, and advanced literature searching, followed by journal club and monograph preparation (Figure 2).

The primary preceptor of the drug information practice experience held the following terminal degrees: post-baccalaureate PharmD, first-profession degree PharmD, MS, or PhD. Sixty-seven percent (34/51) of these respondents also reported having completed postgraduate residencies or fellowships. Forty-one percent (21/51) had specialized in a drug information residency or fellowship training program.

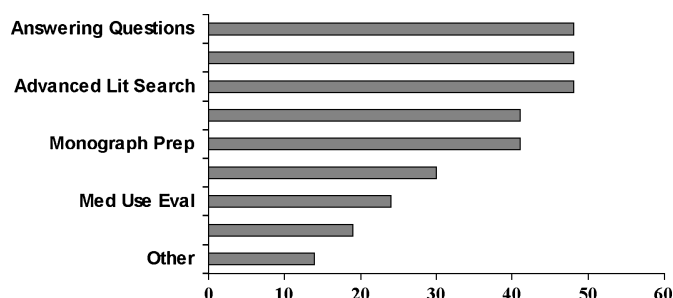


Figure 2. Frequency of Activities Covered in Drug Information Experiential Education.

Survey respondents were then asked to identify the drug information experiential rotation sites that were available for their students. Hospital sites were most commonly used (78%), followed by university sites (61%), poison control centers (53%), industry (35%), and managed care institutions (29%). Fifty-eight percent (29/50) of survey respondents felt they had an inadequate number of drug information training sites.

DISCUSSION

There are several reports in the literature describing studies conducted to determine the level of formalized didactic and experiential drug information instruction in colleges and schools of pharmacy.^{1,13,17-22} In 1982, Kirschenbaum and Rosenberg¹³ conducted a survey to determine the scope of drug information educational programs offered by drug information centers and 72 colleges of pharmacy to fifth-year baccalaureate and post-baccalaureate PharmD candidates. The response rate was 93% (n = 67). Almost all respondents provided some level of formal drug information education to their students. At that time, only 50% of pharmacy schools (n = 32) provided a formal drug information clerkship experience as part of their baccalaureate curricula. In contrast, all schools offering the PharmD program as the first-professional degree (number not stated) provided drug information clerkships as a requirement. The authors concluded that

Table 2. Titles of Required or Recommended Textbooks

Title	n (%)
<i>Drug Information: a Guide for Pharmacists</i>	26 (79)
<i>Interpreting the Medical Literature</i>	2 (6)
<i>Designing Clinical Research</i>	1 (3)
<i>Basic and Clinical Biostatistics</i>	1 (3)
Instructor-prepared course pack	2 (6)
<i>Principles of Evaluating Drug Literature</i>	1 (3)

Table 3. Relative Importance of Drug Information Content Areas

Topics Covered in Course		Frequency	%	Mean Importance Score*
Systematic approach to handling drug information requests	Yes	60	100.0	1.3
Drug literature evaluation	Yes	57	96.6	1.1
Statistics	Yes	46	80.7	1.5
Evidence-based medicine	Yes	49	83.1	1.4
Sources of information (eg, tertiary/secondary/primary, investigational/orphan drugs, pharmaceutical)	Yes	60	100.0	1.3
Formal instruction on finding and/or evaluating internet resources	Yes	56	94.9	1.4
Formal instruction on computer database information retrieval (eg, Micromedex, Medline, IPA)	Yes	58	96.7	1.3
Adverse drug event management	Yes	40	66.7	2.0
Drug policy management (eg, formulary, drug use evaluation, target drugs/therapeutic exchange)	Yes	41	69.5	2.1
Drug approval process	Yes	38	64.4	2.5
Personal library development - keeping current	Yes	43	75.4	2.1
Ethical/legal issues	Yes	43	72.9	2.3
Quality assurance in drug information	Yes	39	67.2	2.0
History and philosophy of drug information services	Yes	37	62.7	2.7

*Based on a scale of 1 to 5 on which 1 = very important and 5 = not important

bachelor of science pharmacy students were receiving insufficient drug information training.

In 1992, Davis and Krucke conducted a survey of drug information educators at 75 schools of pharmacy throughout the United States and Puerto Rico to assess the experience of pharmacy students in drug information courses and clerkships.¹ The overall response rate was 75% (n = 56). At the time of the survey, 77% (n = 43) of the schools of pharmacy continued to offer the BS in pharmacy as the sole first-professional degree. Fifty-seven percent (n = 32) of schools also offered a postbaccalaureate (post-BS) PharmD program and 27% (n = 15) offered a 6-year first-professional PharmD program. Results from this study showed that didactic drug information was a requirement in all of the schools offering a postbaccalaureate PharmD program and in 90% of first-professional PharmD degree programs, whereas more than 70% of schools with a BS program as the sole entry-level program offered didactic drug information instruction as an elective course. All post-BS PharmD degree programs had a drug information clerkship as a requirement. In contrast, drug information clerkships were offered more often on an elective basis at institutions in BS programs and where the only PharmD degree offered is the entry-level type.

In 1994, Mullins et al²² conducted a similar survey to evaluate drug information course content and organization of the 75 schools and colleges of pharmacy existing at that time. Experiential drug information clerkships were not evaluated in this survey. The overall response rate was

89% (n = 66). The results showed that, of the schools that responded, drug information was offered as a separate didactic course to 53% (n = 29) of baccalaureate students, 45% (n = 25) of first-professional degree PharmD students, and 50% (n = 27) of the post-baccalaureate PharmD programs. The schools that did not offer drug information as a separate course indicated a lack of faculty members, lack of time to teach the course, and inclusion of drug information instruction within other courses or clerkships as reasons for not providing the course. Course topics that were strongly emphasized by almost all programs as important were study design, efficient search strategies, types and functions of information resources, oral and written communication skills, and statistical methods.

Our study was designed to characterize the status of drug information education at a time when all schools within the United States were assumed to have transitioned to a first-professional degree PharmD program. This fact is corroborated by all responding schools that offered a campus-based 6-year first-professional degree PharmD as the sole pharmacy degree. Our study response rate of 73 percent also represented a reasonable overview of the status of drug information education within the United States.

Results of this study demonstrated that didactic drug information education was offered in all pharmacy schools with a first-professional degree PharmD program. Seventy percent of these schools indicated that it was a required and standalone course. (These data are also

corroborated in a study²³ where 89% of first-professional degree programs offered a required didactic drug information course). The remainder of schools (30%) indicated that drug information instruction was integrated within another course or across the entire P1 through P4 professional curriculum. In the standalone model, didactic drug information was most often available as a 1-semester course with 2 to 3 classroom hours devoted to it per week. The majority of schools placed didactic drug information in the P2 or P3 years of their curricula. Our results are comparable to the findings of Davis and Krucke¹ where 90% of first-professional degree PharmD programs and 100% of post-baccalaureate PharmD programs offered a required didactic drug information course in contrast to 70% of entry-level BS programs which offered didactic drug information on an elective basis only.

Didactic course contents considered to be very important by all respondents were the following: a systematic approach to handling drug information requests; drug literature evaluation; statistics; evidence-based medicine; sources of information; formal instruction on finding and/or evaluating Internet resources; and formal instruction on computer database information retrieval (eg, Micromedex, MEDLINE, IPA, etc). The authors acknowledge that the position or title of the respondent may have influenced their opinions regarding the importance of drug information skills. However, 44% of respondents were drug information course coordinators and the authors believe the data are representative of content areas that should be considered as part of an ideal drug information curriculum. Mullins et al²² emphasized the following subject areas as important course content: study design, efficient search strategies, types and functions of information resources, oral and written communication skills, and statistical methods.

Our study demonstrated that a major weakness in drug information education was a lack of colleges that offered a pharmacy practice experience in drug information as a required professional clerkship rotation. Sixty-two percent of pharmacy schools in this study offered experiential education in drug information on an elective basis, whereas 15% offered the experiential component as a requirement. The majority of our study respondents (87%) did not indicate any reason (s) for not offering a required experiential component in drug information education despite being provided with the following choices in question 34: drug information training is adequately covered within other courses; lack of faculty resources; lack of adequate training sites; and competition for credit hours within the existing curriculum. The authors believe that this apparent omission of question

34 may have been a misunderstanding of the question by respondents who offered drug information practice experience on an elective basis only. This glaring hole in pharmacy education is also corroborated by Cole and Berensen.²³ The primary reasons given by respondents in their study were a lack of practice sites and a lack of qualified faculty members. The low percentage of programs requiring or offering drug information practice experience in the first-professional degree PharmD programs is similar to that of entry-level BS programs. In 1982,¹³ drug information clerkships were offered in 50% of schools with the entry-level BS program, and similarly in 1992,¹ drug information clerkships were offered more often on an elective basis in schools where the entry-level degrees were either a BS or PharmD degree. In contrast, all colleges that offered the postbaccalaureate PharmD program had a required experiential drug information component in their curriculum. To the investigators' knowledge, there are no data published to support the assertion that not requiring drug information experiential education is a weakness. It is the author's opinion that current students graduating from first-professional degree pharmacy programs may not have adequate drug information skills required to practice pharmacy.

In the survey by Davis and Krucke,¹ the average number of students enrolled per year in the BS programs was 273; first-professional degree PharmD programs had an average of 169 students, and post-baccalaureate PharmD programs were the smallest with an average of 20 students. The increase in class size of the first-professional degree PharmD programs combined with previously indicated inadequate resources in teaching drug information as a required part of the curricula in both the didactic and clerkship components might lead to omissions in previously identified subject matters or the absence of a required drug information experiential education component in contemporary PharmD curricula. There have been a few reports in the literature by schools of pharmacy that have utilized new models to develop students' critical thinking and drug information skills. Some of these models include integrating drug information instruction across the 4-year professional curriculum to provide both didactic and practical learning experience; incorporation of drug information portfolios; developing a drug information laboratory; and using an interactive computer-assisted learning program for teaching drug information.²⁴⁻²⁹

This study was limited in that it was not designed to assess specific outcomes of students' drug information skills and knowledge, nor did it assess the status of drug information residency programs or formal drug information services offered by colleges of pharmacy.

CONCLUSION

All schools that transitioned to the first-professional PharmD program offer a required or integrated didactic drug information course in their curricula. In contrast, the majority of these same schools lack a required experiential drug information component in their curricula. Anecdotally, this apparent glaring hole in contemporary pharmacy education may result in students with poor drug information skills in practice. As the application of advanced-level drug information to patient- or population-based problems should be considered a vital part of the routine practice of pharmacy, outcomes to assess this skill are required in the future. As class sizes have increased while available resources have decreased, a few colleges have become trailblazers in designing a drug-information curricula to include the application of didactic and experiential drug information components across the entire 4-year professional PharmD curricula.

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